DEPARTMENT OF THE ARMY
Omaha District, Corps of Engineers
106 South 15th Street
Omaha, Nebraska 68102-1618

:NOTICE: Failure to acknowledge :
:all amendments may cause rejec- :
:tion of the bid. See FAR :
:52.214-3 of Section 00100 :

Solicitation No. DACA45 02 B 0015

Date of Issue: 21 May 2002
New Date of Opening: 26 Jun 2002

Amendment No. 0001
12 June 2002

SUBJECT: Amendment No. 0001 to Specifications and Drawings for Construction of **Modernize Bridge Crane Controls, Fort Peck, MT**
Solicitation No. DACW45 02 B 0015.

TO: Prospective Bidders and Others Concerned

1. The specifications and drawings for subject project are hereby modified as follows (revise all specification indices, attachment lists, and drawing indices accordingly).

a. Specifications. (Descriptive Changes.)

(1) Page 00010-1, delete date and time of bid opening shown and substitute "26 June 2002" at "2:00".

b. Specifications (New and/or Revised and Reissued). Delete and substitute or add specification pages as noted below. The substituted pages are revised and reissued with this amendment.

Pages Deleted	Pages Substituted or Added
SECTION 14601 CRANES, BRIDGE, TOP RUNNING REVISIONS	SECTION 14601 CRANES, BRIDGE, TOP RUNNING REVISIONS

b. Drawings (Not Reissued). The following drawing sheets are revised as indicated below with latest revision date of 12 June 2002. These drawings are not reissued with this amendment.

(1) Dwg. MFP205-063E2, Sheet E-2, Delete Note 1 and substitute the following:

“1. THE CONTRACTOR SHALL REPLACE THE FOUR EXISTING BRIDGE CRANE CONTROLS WITH MODERN SOLID STATE CONTROLLERS. EACH BRIDGE CRANE HAS A 20-TON MAIN HOIST AND A 2-TON AUXILIARY HOIST. THE FOUR BRIDGE CRANES ARE LOCATED IN FOUR SEPARATE MAIN CONTROL BUILDINGS. BUILDINGS 1 & 2 ARE FOR THE TWO POWER TUNNELS AND BUILDINGS 3 & 4 ARE FOR THE TWO FLOOD CONTROL TUNNELS.
SEE FIO DRAWING 23457 WIRING DIAGRAM. THE CONTRACTOR SHALL MAKE A FIELD SURVEY TO OBTAIN ALL INFORMATION ON THE CRANES NECESSARY FOR THE REVISIONS. THE CONTRACTOR SHALL PROVIDE A NEW PENDENT MOUNTED CONTROL STATION WITH AT LEAST 50' OF CABLE ON AN ELECTRIC POWER CABLE
REEL. THE PENDENT CONTROLS SHALL INCLUDE:
- POWER ON - OFF SWITCH FOR CRANE
- AUXILIARIES ON - OFF SWITCH (POWER FOR PASSENGER CAR SEE NOTE 4)

- INTERCOMM FOR CRANE OPERATOR TO TALK WITH PASSENGER CAR
- RAISE AND LOWER FOR THE 20-TON MAIN HOOK
- RAISE AND LOWER FOR THE 2-TON AUXILARY HOOK
- BRIDGE CRANE TRAVEL NORTH AND SOUTH (USING PLAN NORTH ARROW)
- CRANE TROLLEY TRAVEL EAST AND WEST"

(2) Dwg. MFP205-063E2, Sheet E-2, add the following new notes:

"6. THIS DRAWING SHOWS EXISTING LIGHT FIXTURES, RECEPTACLES, ETC. WHICH ARE NOT IN CONTRACT (NIC).

7. THE CONTRACTOR SHALL REPLACE BRAKE ASSEMBLIES AS NECESSARY TO MEET SPECIFICATION REQUIREMENTS FOR AUTOMATIC STOP SYSTEMS AS SPECIFIED IN SECTION 14601."

c. Drawings (New). The following new "For Information Only" drawing sheet is hereby added to the contract drawings and is issued with this amendment.

(1) Sheet 23457.

2. This amendment is a part of the bidding papers and its receipt shall be acknowledged on the Standard Form 1442. All other conditions and requirements of the specifications remain unchanged. If the bids have been mailed prior to receiving this amendment, you will notify the office where bids are opened, in the specified manner, immediately of its receipt and of any changes in your bid occasioned thereby.

a. Hand-Carried Bids shall be delivered to the U.S. Army Corps of Engineers, Omaha District, Contracting Division (Room 301), 106 South 15th Street, Omaha, Nebraska 68102-1618.

b. Mailed Bids shall be addressed as noted in Item 8 on Page 00010-1 of Standard Form 1442.

3. Bids will be received until 2:00 p.m., local time at place of bid opening, 26 June 2002.

Attachments:
Spec Pages listed in 1.b. above
Dwgs. listed in 1.c. above

U.S. Army Engineer District, Omaha
Corps of Engineers
106 South 15th Street
Omaha, Nebraska 68102-1618

12 June 2002
MFS/4411

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DIVISION 14 - CONVEYING SYSTEMS

SECTION 14601

CRANES, BRIDGE, TOP RUNNING REVISIONS

04/94

-- End of Section Table of Contents --

SECTION 14601

CRANES, BRIDGE, TOP RUNNING REVISIONS
04/94

PART 1 GENERAL

Attachment: Name Plate Data For Shaft Control Gate Cranes

The Contractor shall replace the existing controls on four (4) 20-ton bridge cranes in the Main Control Buildings 1 through 4 at the Fort Peck Dam, MT. The Contractor shall make a field survey to obtain any and all specific data required for the manufacture of the new controls. The Government has one control diagram on the existing bridge cranes. That control diagram is titled WIRING DIAGRAM, 23457, dated 1-17-39 and is included as a For Information Only (FIO) drawing. The original manufacturer of these cranes was Whiting Tiger Crane, Harvey, Ill. That company now is Whiting Corporation and bidders may contact Mr. Greg Ciecierski (708) 587-2112 for any information that they may have on these cranes. Field wiring shall conform with the requirements of Section 16415.

1.1 DISPOSAL

The Contractor shall dispose off site all materials that are removed from the cranes.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC Pub No. S329	(1985; Appx A Jun 1994) Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C80.1	(1995) Rigid Steel Conduit - Zinc Coated

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 325	(1997) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 490	(1997) Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	(1998) Structural Welding Code - Steel

AWS D14.1 (1997) Welding Industrial and Mill Cranes and Other Material Handling Equipment

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-55810 (Apr 1996) Conduit, Metal, Flexible

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE Std 597 (1983; R 1992) Practices and Requirements for General Purpose Thyristor for DC Drives

MATERIAL HANDLING INDUSTRY (MHI)

MHI CMAA 70 (1994) Electric Overhead Traveling Cranes

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA AB 1 (1993) Molded Case Circuit Breakers and Molded Case Switches

NEMA ICS 1 (1993) Industrial Controls and System

NEMA ICS 2 (1993) Industrial Control and Systems: Controllers, Contactors and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC

NEMA ICS 3 (1993) Industrial Control and Systems: Factory Built Assemblies

NEMA ICS 4 (1993 Rev Industrial Control and Systems: Terminal Blocks

NEMA ICS 6 (1993) Industrial Control and Systems: Enclosures

NEMA ST 1 (1988; R 1994) Specialty Transformers (Except General-Purpose Type)

NEMA WC 70 (1999) Non-Shielded Power Cable 2000 V. or Less

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (1999) National Electrical Code

UNDERWRITERS LABORATORIES (UL)

UL 489 (1996; Rev thru Dec 1998) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

UL 943 (1993; Rev thru May 1998) Ground-Fault Circuit-Interrupters

1.3 SYSTEM DESCRIPTION

1.3.1 General Requirements

1.3.1.1 Standard Products

Materials and equipment shall be standard products of manufacturers regularly engaged in the fabrication of crane controls and shall essentially duplicate items which have been in satisfactory use for at least 2 years prior to bid opening. Any company licensed by a crane manufacturer to manufacture cranes bearing their name shall have the design and components approved by the licensor prior to submission to the Government for approval.

1.3.1.2 Nameplates

Each major component of equipment shall have the manufacturer's name, address, type or style, model or catalog number, and serial number on a metal plate secured to the equipment.

1.3.1.3 Verification of Dimensions

The Contractor shall verify all dimensions in the field and shall advise the Contracting Officer of any discrepancy before performing any work.

1.3.1.4 Welding

Welding shall be in accordance with qualified procedures using AWS D14.1 as modified. Written welding procedures shall specify the Contractor's standard dimensional tolerances for deviation from camber and sweep and such tolerances shall not exceed those specified in AWS D14.1. All welding shall be performed indoors. Welders and welding operators shall be qualified in accordance with AWS D1.1 or AWS D14.1. Allowable stress values shall be in accordance with MHI CMAA 70.

1.3.2 Design Criteria

The cranes are existing and the new controls shall be designed to operate in the spaces and match the runway dimensions and rails indicated. The hook coverage and hook vertical travel shall not be less than that existing.

1.3.2.1 Classification

The cranes are existing and the new controls shall be designed and constructed to MHI CMAA 70 Class B, Light Service requirements for operation in indoor nonhazardous environment.

1.3.2.2 Rated Capacity and Speeds

The rated capacity of the crane is 20 tons. The auxiliary hoist capacity is 2 tons. The lower load block and hook shall not be considered part of the rated capacity. Rated speeds for the hoist, bridge and trolley shall be as existing.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Bridge Crane System; G-RE.

A complete list of equipment and materials, including manufacturer's descriptive data and technical literature, performance charts and curves, catalog cuts, and installation instructions.

Spare Parts; G-RE.

Spare parts data for each different item of material and equipment specified, after approval of the detail drawings. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

SD-02 Shop Drawings

Bridge Crane System; G-RE.

Detailed drawings containing complete wiring and schematic diagrams and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout and anchorage of equipment and appurtenances and equipment relationship to other parts of the work including clearances for maintenance and operation.

SD-08 Manufacturer's Instructions

Bridge Crane System; G-RE.

Diagrams, instructions, and other sheets proposed for posting.

SD-06 Test Reports

Acceptance Testing; G-RE.

Test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system. The report shall include the information as required by paragraph ACCEPTANCE TESTING.

1.5 DELIVERY AND STORAGE

Equipment delivered shall be placed in indoor storage, protected from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

PART 2 PRODUCTS

2.1 STRUCTURAL MATERIALS

2.1.1 Bolts, Nuts, and Washers

Bolts, nuts, and washers shall conform to ASTM A 325 bolts. High strength bolted connections shall conform to the requirements of AISC Pub No. S329, except that ASTM A 490 bolts shall not be used. No galvanized bolts shall be used.

2.2 ELECTRICAL COMPONENTS

2.2.1 Power Supply

2.2.1.1 General

Electric power for the normal operation of the crane will be supplied from the nominal 440 volt, 3-phase, ungrounded, 60-Hz ac power distribution system.

2.2.1.2 Incoming Power Supply

a. General - Incoming power from the above power receptacles shall be brought into the crane by means of a Type G, three-conductor, 600-volt rubber or rubber-like insulated and extra-heavy-duty neoprene-jacketed portable power cable. The cable shall have a usable length of not less than 40 feet, and shall be wound upon the cable reel to be furnished and mounted on the crane. The power plug shall be installed on the free end of the cable and an anchorage shall be provided to relieve the power plug and receptacle from the strain of reeling and unreeling the cable. The grounding conductors shall make electrical connection to the crane structure through the fourth collector ring and brush of the cable reel and shall be connected to the ground terminal of the power plug.

b. Cable Reel - The cable reel shall be rated for constant duty, 50 amperes continuous, 600-volt AC, shall be provided with four collector rings and brushes, shall be of weather-proof construction, shall maintain approximately uniform tension in the cable, and shall automatically "pay out" and "take up" the cable as required by the crane travel. The cable reel shall be provided with a positive driven or actuated limit switch that will prevent excess "takeup". The reel shall be mounted on the crane in a location, as approved, that will allow ready maintenance and inspection as well as satisfactory operation.

2.2.1.3 Incoming Power Circuit Breaker

The crane's normal power supply shall be controlled by means of a 440 volt, three-pole, manually operated air circuit breaker having a suitable ampere rating. Short circuit protection only shall be provided. The breaker shall be mounted on the protective panel.

2.2.2 TROLLEY CONDUCTORS

2.2.2.1 Festoon Conductors

Power and control circuits may be brought to the crane trolley by means of a "festoon" system consisting of jacketed and color coded multiple conductor power and control cables which shall be bundled and supported by four-wheel trolleys running on "I" beam rails mounted on the inside of the main trolley girders. Trolley wheels shall be provided with antifriction bearings. The conductors of all cables shall be terminated at each end by terminal lugs connected to terminal blocks conforming to NEMA ICS 4 mounted in cast iron junction boxes of NEMA Type 4 construction conforming to Part ICS-1-110 of NEMA ICS 1. Power and control circuits shall be segregated and terminated in separate junction boxes. Two extra conductors shall be provided in each control cable. All cable of a given "festoon" group shall be bundled together using nylon lacing material. All cables shall be

supported with sufficient trolleys to maintain a minimum of 12 inches from the top of the lifting beam.

2.2.3 Control Systems

A separate controller shall be provided for each motor; however, a duplex controller shall be used for two motor bridge drives. Overload protection shall be in conformance with the requirements of NEMA ICS 2. Contactors that are used for starting, stopping, and reversing shall be mechanically and electrically interlocked.

2.2.3.1 Hoist Control System

a. Motion Control - The main hoist and auxiliary hoist motion control system shall be AC static stepless control.

b. Motor Control - The hoist motor control shall provide AC static stepless control. The control shall provide for continuously adjustable speeds throughout the range from minimum speed to maximum speed. Eddy-current braking shall provide a retarding torque for control of light loads in the hoisting direction and all loads in the lower direction of subsynchronous speed. To reduce holding brake wear, the control shall be arranged so that the electric load brake is effective in slowing the motion when the control is in the OFF position. The minimum hoist position of the control shall not allow the hook to lower with full rated load on the hook. Minimum lowering speed at rated hook load shall not exceed 15 percent of rated speed. Minimum speed hoisting with an empty hook shall not exceed 20 percent of synchronous motor speed. All loads up to 100 percent rated capacity shall raise on the minimum speed point of the master.

2.2.3.2 Travel Control System

The bridge and trolley motion control system shall be AC static stepless control.

a. Bridge and Trolley Control - Bridge and trolley main control systems shall be AC static stepless. The control shall provide continuously adjustable speed from minimum to full speed. The minimum speed with zero hook load shall not exceed 10 percent of full rated speed. The control shall provide speed regulation of 15 percent or less from no load to full load at all speed settings.

b. Drift Point - With the master switch in the "Off" position, operation of a thumb-operated auxiliary switch in the operating lever shall actuate the drift position. In the "Drift" position, the electric brakes shall be released and the crane travel motor or motors de-energized to allow full control of drifting travel.

2.2.3.3 Magnetic Control Equipment

The primary and accelerating contactors and/or static devices shall be mounted on one or more panels and shall be enclosed in a cabinet or cabinets. The control circuits shall be wired to terminal blocks or studs complete and ready for making all external connections. Insulated wire shall conform to the requirements of paragraph CONDUIT AND WIRING. Magnetic contactors for individual motor controls shall have a rating the equivalent of the motor controlled, but in no case shall a contactor less than NEMA size 1 be used. The protective panel main line contactor shall

be rated in accordance with NEMA ICS 3 for Service Class I, except that in no case shall the rating be less than one NEMA size greater than the largest individual motor contactor used.

2.2.3.4 DC Conversion Equipment

a. General - Each crane motion which requires independent operation shall be provided with a separate control and solid-state conversion unit except that a single solid-state conversion unit and set of control equipment may be used in event more than one gantry travel motors is provided.

b. Solid-State Conversion Unit - The power conversion system for each motion shall be solid-state, silicon-controlled rectifier or thyristor with adequate capacity to drive its connected DC motor or motors at all specified speeds and loads. The conversion unit (including overload protection) shall be rated for continuous duty at the motor current necessary to lift 150 percent rated load at any speed point, and shall have a 1-minute rating equal to the necessary current to develop a motor torque corresponding to 200 percent of rated load. Rectifier elements shall be hermetically sealed and mounted on heat sinks cooled by natural convection, except that forced-air cooling may be used if over-temperature protection is provided for the rectifiers. Forced-air cooled units must be capable of delivering full-load without damage for not less than 5 minutes following loss of the cooling. The rectifier system shall be built, installed, and enclosed in accordance with IEEE Std 597. Minimum protection shall consist of line isolating transformers, transient voltage and current surge suppressors, and either current-limiting rectifier fuses or static instantaneous overcurrent circuits with sensing in each phase of the AC line. Individual Thyristors shall be with ultrafast current-limiting rectifier fuses and shall be provided with failure indication. The control circuit shall include an adjustable-operating current limit circuit capable of limiting maximum current to not more than the current necessary to obtain 200 percent motor torque. The repetitive peak inverse voltage rating of the rectifier shall be not less than 250 percent of the working peak inverse voltage. Thyristor case temperature shall not exceed 100 degrees C in a 30 degrees C ambient when delivering rate load. When parallel operation of thyristors is required, each unit's actual share of the load shall not differ from its calculated share by more than 10 percent. Purposely matched units shall not be used. Parallel operation of thyristors will not permitted for individual loads less than 235 amperes RMS. The firing pulse for paralleled thyristors shall have a rise time less than 0.5 microsecond and a peak gate current not less than 1.5 amperes. The firing pulse for nonparalleled thyristors shall have a rise time less than 1 microsecond and a peak gate current not less than 1 ampere for all devices rated above 35 amperes RMS. The maximum value of the DC average voltage output shall not exceed 500 volts.

2.2.3.5 Control Panels

Control panels shall be fabricated of solid sheet steel designed and constructed to conform to the requirements of NEMA ICS 6 Type 12. Thermostatically controlled heaters shall be provided in each panel. Control panel doors shall be hinged, equipped with gaskets, and shall be fitted with key-lock handles designed to latch the door at top, center, and bottom. A single key shall open all locks.

2.2.3.6 Pendant Control Station

a. Design - The pendant control station shall be suspended from the crane by a strain chain or 1/4 inch (minimum) wire rope strain lead of corrosion resistant steel. The pendant station shall be attached to the underside of the crane. The pendant control station enclosure shall be NEMA Type 4 in accordance with NEMA ICS 6. Pushbuttons shall be heavy duty, dust-and-oil-tight type having distinctly felt operating positions. Pushbuttons shall be so constructed that they cannot become hung-up in the control case. Pendant shall include a separate set of pushbuttons for each motion and for POWER ON-POWER OFF. A blue pilot light to indicate that the main contactor is energized and a white pilot light to indicate that power is available on the load side of the crane disconnect switch shall also be provided. The POWER OFF pushbutton shall have a bright red mushroom head. Operating pushbuttons and pilot lights shall meet the heavy-duty requirements of NEMA ICS 2. Pushbuttons shall be as follows:

Hoist - up
Hoist - down
Bridge - North
Bridge - South
Trolley - East
Trolley - West
POWER OFF
POWER ON
Auxiliary Hoist - up
Auxiliary Hoist - down
Intercom to Passenger Car
Auxiliaries Power OFF
Auxiliaries Power ON

b. Pendant Drive Control - three-position momentary contact spring return to OFF toggle switch shall be provided to control the motorized trolley for the pendant.

c. Pendant Festoon System - The pendant festoon system shall consist of a support rail, flat cables, junction boxes, cable cars, and accessories. All hardware shall be corrosion resistant. Cable loops shall not drop below the hook high position. The pendant control car shall be provided with NEMA Type 4 junction box. The pendant festoon shall be independent of trolley motion.

d. Pendant Drive System - The pendant festoon system shall be provided with a motor drive system capable of driving the pendant control car at 5 fpm. The pendant motor drive shall be controlled from the pendant.

e. Pendant Retraction System - The pendant control car shall be provided with an electric powered cable reel such that the pendant station may be retracted fully.

2.2.3.7 Protection

a. Main Line Disconnect - A main line disconnect consisting of a combination circuit breaker and nonreversing starter (main line contactor) in NEMA Type 12 enclosure shall be provided. The main line disconnect shall be controlled by a control circuit such that all crane motions shall be stopped upon main line undervoltage, overload, control circuit fuse failure, or operation of the POWER OFF pushbutton.

b. Circuit Breakers - Circuit breakers shall meet the requirements of UL 489 and NEMA AB 1.

c. Overloads - AC circuit overload relays shall be of the ambient compensated, automatic reset, inverse time type located in all phases of the main line and individual motor circuits and arranged to open the main line contactor.

2.2.3.8 Limit Switches

Limit switches shall be heavy duty quick-break double-pole double-throw type and shall conform to NEMA ICS 2. Geared limit switch interruption of a motion in one direction shall not prevent the opposite motion. Geared limit switches shall reset automatically. Limit switch housings shall be NEMA Type 12. Limit switches shall interrupt power to the control systems.

a. Hoist Upper Limit Switches - Two limit switches shall be provided for each hoist. A rotating adjustable geared control circuit interrupt limit switch shall provide hoist-up limiting. A secondary hoist upper limit shall be provided with a weight operated limit switch, to prevent raising beyond their safe limit. This secondary limit switch shall operate to interrupt power to all hoist motor conductors and set the hoist holding brakes.

b. Hoist Lower Limit Switches - Hoists shall be provided with a rotating adjustable geared control circuit interrupt limit switch for hoist-down travel limiting.

c. Bridge and Trolley Travel Limit Switches - Runway (track) limit switches shall be mounted to the crane bridge and trolley, respectively, adjacent to one runway rail to interrupt current to the bridge and trolley controls. Adjustable limit switch actuators shall be installed on both ends of those rails to actuate the limit switches and stop the crane bridge or trolley prior to contacting the runway bumpers.

d. Rail Clamp Limit Switches - Each rail clamp shall be furnished with a limit switch designed to interrupt the control circuits to the bridge drive when the rail clamps are set. A red pilot light shall be provided at the control station to indicate the rail clamps are set.

2.2.3.9 Warning Horn

A solid state electronic warning horn shall be provided on the crane. Any bridge or trolley motion shall be accompanied by a continuous series of alternating tones.

2.2.3.10 Load Limit System

A load limit system shall be provided for the main hoist. The primary purpose of the load limit system is to inform the operator by an alarm that the preset load has been exceeded. The system shall consist of a load cell, load sensing electronics, no-load and overload indicator lights, overload alarm bell, and alarm cut-out switch. The load cell shall be mounted to receive the load from the axle of the equalizing sheave. The alarm setpoint shall be adjustable.

2.2.4 Motors

2.2.4.1 General Requirements

Motors are existing and were designed specifically for cranes and hoist duty. Drain holes shall be provided at low points near each end. Inspection and service covers shall be provided with gaskets. All hardware shall be corrosion resistant.

2.2.4.2 Main and Auxiliary Hoist Motor

The hoist and auxiliary motors are existing. See attached nameplate data.

2.2.4.3 Bridge and Trolley Drive Motors

The bridge and trolley drive motors are existing. See attached nameplate data.

2.2.5 Electric Brakes

The Contractor shall inspect the existing brake pads and replace with new non-asbestos pads. The Contractor shall follow all federal and state laws in regards to disposal of asbestos brake pads.

2.2.5.1 Hoist Brake Time Delay

One of the hoist holding brakes shall be provided with a time delay setting (from 1 to 3 seconds). Such time delay shall be initiated upon release of the control pushbutton or return of the master switch to OFF.

2.2.5.2 Automatic Stop System

All electrically controlled brakes shall be applied automatically when power is interrupted. Brakes shall be wired so that the brakes release upon operation of a pushbutton for the associated drive and shall set upon release of that pushbutton, return of the master switch to OFF, operation of POWER OFF pushbutton, de-energization of main line contactor, or power failure. Electric brakes shall be designed so that they can be mechanically released. Enclosures for brake electrical components shall be NEMA ICS 6. DC shunt magnetic shoe brakes shall be provided with an electrical forcing circuit for rapid release of the brake. Each shunt coil brake shall be circuited so that both conductors supplying the brake are opened simultaneously when the brake is de-energized.

2.2.6 Lighting Heating and Convenience Outlets

Three-phase 208Y/120-volt AC power, supplied via a circuit breaker and isolation transformer conforming with NEMA ST 1 from the line side of the main line disconnect shall be used for lighting, heaters, and accessory circuits on the crane. The circuit breaker shall have a NEMA 12 enclosure in accordance with NEMA ICS 6. The enclosure shall have provisions to lock the breaker in the OFF position. Each pole of the circuit breaker shall have individual thermal and magnetic trip elements; a button shall be provided on the enclosure cover for mechanically tripping the circuit breaker. A three-phase 480-volt delta primary, and 208Y/120-volt wye secondary general lighting isolation transformer shall be fed from the accessory circuit breaker and shall feed a 208Y/120-volt UL listed circuit breaker panelboard and a heater circuit breaker/combination starter. The panelboard shall supply branch circuits for utilization of various

accessories such as receptacles, lighting, and panel internal lighting.

2.2.6.1 Transformers

Transformers shall be dry type and shall carry full load continuously at rated voltage and frequency without exceeding an average temperature rise of 115 degrees C above an ambient temperature of 40 degrees C. The transformer shall have a totally enclosed case which shall be finished with manufacturer's standard coating system. Transformers shall be fully encapsulated, except for those specifically designed for use as an isolation transformer for static power conversion units.

2.2.6.2 Receptacles

Receptacles shall be, single-phase, 120-volt 15-amp, grounded, duplex with metal NEMA 12 enclosure with self-closing weather-proof receptacle cover. A receptacle shall be provided on each passenger car. Breakers used to protect circuits supplying receptacles shall incorporate ground fault current interruption feature and meet the requirements of UL 943.

2.2.6.3 Anticondensation Heaters

All control panels shall be equipped with thermostatically controlled anticondensation heaters. The circuit breaker combination magnetic starter shall be NEMA 12 enclosure in accordance with NEMA ICS 6. The magnetic starter shall be equipped with manually reset overload relays and shall be interlocked with the main line disconnect so that all anticondensation heaters are de-energized when the main line disconnect is energized; and shall be energized when the main line disconnect is de-energized.

2.2.7 Conduit and Wiring

2.2.7.1 General

All wiring between equipment units or components, except where flexible connections are specified, shall be installed in rigid, steel conduit with threaded condulet fittings and zinc-coated NEMA 12 outlet and pull boxes. Conduit connections to motors, brakes, limit switches, wheel trucks, and other items where flexible connections are required shall be made using short lengths of liquid-tight flexible conduit. The conduit shall be securely mounted and fastened to the crane framework and shall be installed in a neat and workmanlike manner. Change of direction of a conduit run shall be made by means of threaded condulet fittings and the conduit shall be installed to fit close to the crane framework. Conduit unions shall be used where standard couplings cannot be used to join conduits or as required to permit dismantling for shipment. No running threads will be permitted. Ends of conduits shall be carefully reamed.

All threaded connections shall be made up with a compound composed of colloidal copy and rust inhibitors. Separate conduit systems shall be provided for power, control, and lighting circuits. The entire conduit system shall be grounded and shall be installed so that any moisture will be drained from terminal boxes and equipment. All conduit connections to equipment enclosures shall be watertight threaded. Suitable "drain-breather" devices shall be provided at all low points of the conduit system to allow water to escape continuously. The conduit system shall be installed in the shop, complete and ready for installing wire and after inspection shall be dismantled as necessary for shipment to the site.

2.2.7.2 Conduit

a. Rigid Conduit - Rigid steel conduit shall conform to ANSI C80.1 and shall, in addition, be zinc-coated (galvanized) both inside and outside by the hot-dip method.

b. Flexible Conduit - Flexible conduit shall conform to CID A-A-55810, shall have a hot-dipped galvanized steel core, copper ground wire, and a waterproof extruded PVC cover.

2.2.7.3 Insulated Wire and Cable

a. Materials, Construction and Tests - Materials, construction, and tests, unless otherwise specified, shall conform to the applicable requirements of NEMA WC 70. Parts, tables, sections, appendices, grades, and classes specified will refer to the above NEMA standards, unless otherwise stated.

b. Conductors - Conductors shall be annealed copper wire. Copper conductors shall be tin or lead alloy coated, or bare, as required by the type of insulation used. All conductors shall have class B or C standing. Solid conductors will not be permitted.

c. Insulation

(1) Material

Insulation shall be a cross-linked polyethylene meeting the dimensional, electrical, and physical requirements of NEMA WC 70. Type I or Type II grade of EPR insulation shall be used for single-conductor cables with a jacket and for the individual conductors of a multiple-conductor cable with an overall jacket.

(2) Insulation Thickness

Insulation thickness shall be as required by NEMA WC 70 for rated circuit voltage of 0-600 volts. Single-conductor cross-linked polyethylene insulated cables with Column A thickness only will be permitted without a jacket. Single-conductor ethylene-propylene-rubber insulated conductors with Column A thickness will not be permitted.

d. Type - Unless otherwise specified or approved, all wire and cable for power, control, and lighting shall be single conductor.

e. Jackets - An outer jacket of a synthetic thermosetting material shall be applied over multiple-conductor cables. Single-conductor cables and individual conductors of a multiple-conductor cable may have a jacket. The jacket shall be tightly and concentrically formed around the core of the cable. Single-conductor cables shall have jackets when insulation thickness is in accordance with NEMA WC 70. The jacket shall be a synthetic thermosetting compound and shall conform to one of the following:

(1) Heavy-duty black neoprene in accordance with paragraph 4.4.3 of NEMA WC 8.

(2) Heavy-duty black chlorosulfonated polyethylene in accordance with paragraph 4.4.9 of NEMA WC 8.

f. Dimensional Tolerance - The outside diameter of single-conductor wires and cables shall not vary more than 5 percent from the calculated outside diameter based on the thickness, including tolerance, of the component materials specified.

g. Wires - Near resistors, wiring exposed to heat shall have flame retardant, heat and moisture resistant insulation, and conform to the requirements of NFPA 70 and the following: Maximum operating temperature for conductors generally shall be 90 degrees C except that maximum operating temperature for internal wiring conductors in resistor cabinets shall be 125 degrees C.

h. Control Panel Wiring - Control panel wiring shall be stranded copper switchboard wire with 600-volt insulation and except for type SIS shall be coated. The wire shall be AVB or SIS. Hinge wire shall have Class K stranding. Hinge wire shall be used between stationary and hinged equipment and shall be formed in wire loops or bundles at least 2 feet long which shall provide rotation around the longitudinal axis of the conductors.

i. Festoon System Cable - The connections to the trolley shall be made using type G cables with 75 degrees C, 600-volt insulation and heavy-duty "Neoprene" jacket for the power circuits and type SO cord with 60 degrees C, 600-volt insulation and "Neoprene" jacket for control and lighting circuits. Type G cables and SO cords shall conform to the applicable requirements of NEMA WC 70. Conductors shall have not less than class H stranding.

j. Current Carrying Capacity - Wire for power and motor circuits shall have a current carrying capacity of not less than the full-load current of the motor or the circuit but in no case less than No. 10 AWG. Wire for control circuits shall not be smaller than No. 14 AWG. Wires exposed to heat or in resistor cabinets shall be sized as required but in no case less than No. 10 AWG.

k. Terminations and Continuity - All conductor connections, except for splices in lighting conductors which are made in junction boxes, shall be terminated at terminal studs or terminal blocks using approved indented terminal ring-tongue connectors. All screw terminals shall have lockwashers and all stud terminals shall have contact nuts and either locking nuts or lock washers. Splices will be permitted only in accordance with NFPA 70.

2.2.8 Fungus Resistance

Electrical connections, such as terminal and circuit connections, components and circuit elements, shall be coated with fungus-resistant varnish except that components and elements inherently inert to fungi or hermetically sealed need not be treated; components and elements whose operation will be adversely affected by the application of varnish shall not be treated.

2.3 PASSENGER CAR ALTERATIONS

The Contractor shall make alterations to three (3) existing passenger cars which are used for tunnel inspections. The Contractor shall make a field survey to obtain dimensions and any other required data for the alterations to the three passenger cars. The Government does not have any drawings for

these passenger cars. The Contractor shall install an automatic power cable reel which shall provide an intercom circuit for communication between the car and the bridge crane operator, a car light circuit, a 20-ampere duplex GFI receptacle circuit on the car, a circuit for the automatic operation of the power cable reel, and an emergency stop crane lower circuit. The cable reel shall be provided with 250 feet of cable with sufficient conductors, collector rings and brushes for all required circuits, shall be of weather-proof construction, shall maintain approximately uniform tension in the cable, and shall automatically "pay out" and "take up" the cable as required by the hoist travel. The cable reel shall be provided with a positive driven or actuated limit switch that will prevent excess "takeup". The reel shall be mounted on the passenger car in a location, as approved, that will allow ready maintenance and inspection as well as satisfactory operation. The Contractor shall provide an interface connection with the bridge cranes that will allow any passenger car to be used with any of the four bridge cranes. The connection shall have a positive locking means such as a twist-to-lock or a mechanical bail or other approved locking method.

PART 3 EXECUTION

3.1 SHOP ASSEMBLY AND TESTS

The new crane controls shall be shop assembled and operated under their own power. Permanent wiring except wire which would be disassembled or partly disassembled for shipment shall be installed. The Contractor shall notify the Contracting Officer three days prior to testing operations.

3.2 ERECTION

Erection shall be in accordance with the manufacturer's instructions and as indicated.

3.2.1 Erection Procedures

After the new controls have been installed, any damaged painted surfaces shall be cleaned and repainted.

3.2.2 Electrical Alignment

The control system shall be aligned in accordance with manufacturer's instructions. Alignment data shall include timer settings, resistor tap settings, potentiometer settings, test point voltages, supply voltages, motor voltages, motor currents, and test conditions such as ambient temperature, motor load, date performed, and person performing the alignment. A copy of the final alignment data shall be stored in control panel door.

3.3 ACCEPTANCE TESTING

3.3.1 Crane Test

The Contractor shall provide all personnel necessary to conduct the tests including but not limited to crane operators, riggers, rigging gear, and test weights. Testing shall be performed in the presence of Contracting Officer. The Contractor shall notify the Contracting Officer three days prior to testing operations.

3.3.1.1 Test Sequence

The crane shall be tested according to the applicable paragraphs of this procedure in the sequence provided.

3.3.1.2 Test Data

Operating and startup current measurements shall be recorded for electrical equipment (motors and coils) using appropriate instrumentation. Speed measurements shall be recorded as required by the facility evaluation tests (normally at 100 percent load). Recorded values shall be compared with design specifications or manufacturer's recommended values; abnormal differences shall be explained in the remarks and submitted for approval or appropriate adjustments performed. In addition, high temperatures or abnormal operation of any equipment or machinery shall be noted, investigated, and corrected. Hoist, trolley, and bridge speeds should be recorded during each test cycle.

3.3.1.3 Equipment Monitoring

During the load test, improper operation or poor condition of safety devices, electrical components, mechanical equipment, and structural assemblies shall be monitored. Observed defects critical to continued testing shall be reported immediately to the Contracting Officer, and testing shall be suspended until the deficiency is corrected. During and immediately following each load test, the following inspections shall be made:

a. Inspect for evidence of bending, warping, permanent deformation, cracking, or malfunction of structural components.

b. Inspect for evidence of slippage in wire rope sockets and fittings.

c. Check for overheating in brake operation; check for proper stopping. All safety devices, including emergency stop switches and POWER OFF pushbuttons, shall be tested and inspected separately to verify proper operation of the brakes.

d. Check for abnormal noise or vibration and overheating in machinery drive components.

e. Check wire rope sheaves and drum spooling for proper operation, freedom of movement, abnormal noise, or vibration.

f. Check electrical drive components for proper operation, freedom from chatter, noise, or overheating.

g. Inspect external gears for abnormal wear patterns, damage, or inadequate lubrication.

3.3.2 No-Load Testing

3.3.2.1 Hoist Operating and Limit Switch Test

The load hook shall be raised and lowered through the full range of normal travel at rated speed and other speeds of the crane. The load hook shall be stopped below the geared limit switch upper setting. In slow speed only, proper operation of upper and lower limit switches shall be verified. The test shall be repeated a sufficient number of times (minimum of three) to demonstrate proper operation. Brake action shall be tested in each

direction. The proper time delay shall be verified between the actuation of the dual brakes.

3.3.2.2 Trolley Travel

The trolley shall be operated the full distance of the bridge rails exercising all drive speed controls in each direction. Brake operation shall be verified in each direction. In slow speed the trolley bumpers shall contact the trolley stops located on the bridge girders.

3.3.2.3 Bridge Travel

The bridge shall be operated the full distance of the runway exercising all drive speed controls, in each direction. Brake operation shall be verified in each direction. In slow speed, the proper operation (interrupt power, automatic reset) of the bridge limit switches at both limits of bridge motion shall be tested. In slow speed, the crane bridge bumpers shall contact the runway rail stops.

3.3.2.4 Hoist Loss of Power No-Load Test

The hooks shall be raised to a height of approximately 12 feet or less. While slowly lowering the hook, the main power source shall be disconnected verifying that the hook will not lower and that both brakes will set.

3.3.2.5 Travel Loss of Power No-Load Test

With the hook raised to clear obstructions and the trolley traveling in slow speed, the main power source shall be disconnected verifying that the trolley will stop and that the brake will set. The test shall be repeated for the bridge slow speed drive controls.

3.3.3 Load Test

3.3.3.1 Hoist

Unless otherwise indicated, the following tests shall be performed using a test load of 125 percent of rated load.

a. Hoist Static Load Test: Holding brakes and hoisting components shall be tested by raising the test load approximately 1 foot and manually releasing one of the holding brakes. The load shall be held for 10 minutes. The first holding brake shall be reapplied and the second holding brake released. The load shall be held for 10 minutes. Any lowering that may occur indicates a malfunction of the brakes or lowering components.

b. Dynamic Load Test: The test load shall be raised and lowered at each speed through the full operating range. The machinery shall be completely stopped at least once in each direction to ensure proper brake operation.

c. Hoist Load Brake: With test load raised approximately 5 feet and with the hoist controller in the neutral position, the holding brake shall be released. The load brake shall be capable of holding the test load. With the holding brake in the released position, the test load shall be lowered (first point) and the controller shall be returned to OFF position as the test load lowers. The load brake shall prevent the test load from accelerating.

d. Hoist Loss of Power Test: After raising the test load to approximately 8 feet, begin slowly lowering the test load, the main power source and the control pushbutton shall be released verifying that the test load will not lower and that both brakes will set.

e. Trolley Dynamic Load Test: While operating the trolley the full distance of the bridge rails in each direction with test load on the hook (one cycle), the proper function of all speed control points and proper brake action shall be tested.

f. Bridge Dynamic Load Test: With test load on the hook, the bridge shall be operated for the full length of the runway in both directions with the trolley at each extreme end of the bridge. Proper function of all drive speed control points and brake action shall be verified. Binding of the bridge end trucks shall indicate malfunction.

3.3.3.2 Trolley and Bridge Loss of Power Test

Using a test load of 100 percent of rated load, the load shall be raised clear of any obstructions on the operating floor. Starting at a safe distance from walls or other obstructions, a slow speed shall be selected using the trolley and bridge drive. While maintaining a safe distance to obstructions, the main power source shall be disconnected and the brakes shall be verified to have set and that the equipment stops within the distance recommended by the manufacturer.

3.4 FRAMED INSTRUCTIONS

Framed instructions under acrylic plastic or in laminated plastic, including wiring and control diagrams showing the complete layout of the entire system, shall be posted where directed. Condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified above for the wiring and control diagrams, and posted beside the diagrams. The framed instructions shall be posted before acceptance testing of the systems.

3.5 MANUFACTURER'S SERVICES

Services of a manufacturer's representative who is experienced in the installation, adjustment, erection, and operation of the equipment specified shall be provided. The representative shall supervise the installation, adjustment, and testing of the equipment.

3.6 FIELD TRAINING

A field training course shall be provided for designated operating staff members. Training shall be provided for a total period of six hours of normal working time and shall start after the system is functionally complete but prior to final acceptance tests. Field training shall cover all of the items contained in the operating and maintenance instructions. The Contracting Officer shall be given at least 2 weeks advance notice of such training.

3.7 SPARE PARTS

One set of manufacturer's recommended spare parts shall be furnished and

delivered to the site. The spare parts shall be suitably packaged for long-term protection and storage. The packaging shall be legibly labeled to identify the spare parts. A list of the furnished spare parts shall be included in the Maintenance manual.

-- End of Section --

Typical nameplate data for Shaft Control Gate Canes (reference DACW45-02-B-0015, Bridge Crane Controls, Fort Peck Project, MT) are as follows

Auxiliary Hoist

Westinghouse type D-254 Gear Motor, Variable Speed
439
Type CW Induction Motor
3 hp 440 volt 254 frame
5.2 amperes per terminal 60 cycles
3 phase
ROTOR CIRCUIT
116 volts between rings 12.2 amperes per ring
40°c rise 145 rpm serial # 29423
oil capacity 3.5 quarts
BRAKE DATA
High Stearns duty Milwaukee WI
Serial # 13959 size 84-A
440 volt 60 cycles 20 lbs. ft
WIRING DATA
Single speed two voltages series and parallel star

Bridge Motor

Westinghouse Type CI Induction Motor Variable Speed
Frame 364 10 hp 3 phase 60 cycles
440 volt 16.5 amperes per term
865 rpm full load 100% load .5hrs 50° C rise
max torque at 1ft RAD 200 lbs.
ROTOR CIRCUIT
118 volts between rings 39 amperes per ring
style 21W647 serial # 2-21W647
BRAKE DATA
Manual foot pedal brake
WIRING DATA
Single speed two voltage series and parallel star

Trolley Motor

Westinghouse Type CI Induction Motor
5 hp 3 phase 60 cycle 440 volt
8.5 amperes per terminal 863 rpm at full load
100% load .5 hrs 50°C rise frame 324
max torque at 1ft RAD 85 lbs.
ROTOR DATA
85 volts between rings 27 amperes per ring
style 21W648 serial # 4-21W648
WIRING DATA
single speed two voltages series and parallel star
SOLENOID BRAKE DATA
General Electric
CR9503-206-B solenoid
Cat 4986335-AB-203
volt 440 cycle 60
coil T-3022147 spec B-3022148

Main Hoist

Westinghouse Type CW Induction Motor
25 hp 3 phase 60 cycle
440 volt 33.3 amperes per terminal
870 rpm at full load
cont. rating at full load 40° rise frame 444
ROTOR CIRCUIT
270 volts between rings 44 amperes per ring
Style 21W646 serial # 2-21W646
WIRING DATA
single speed two voltages series and parallel star
SOLENOID BRAKE DATA
solenoid CR9503-213-A Cat 2825816-AB-203
440 volts 60 cycles
coil T-3021731 Spec B-3021730